Freshwater CyanoHAB Monitoring

NJDEP Division of Water Monitoring
& Standards
Bureau of Freshwater and
Biological Monitoring

Tom Miller, Principal Biologist

September 23, 2015

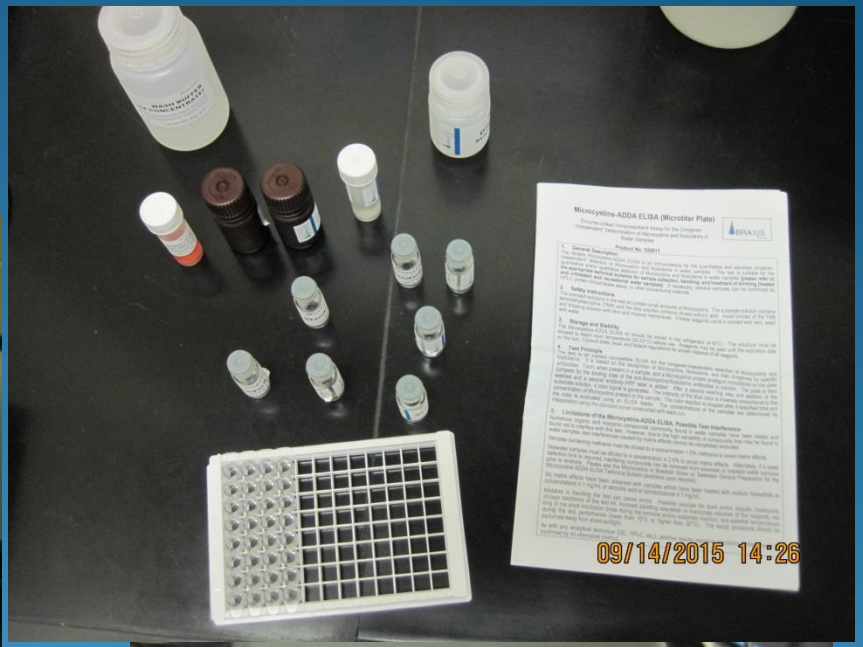
Monitoring Capacity Building

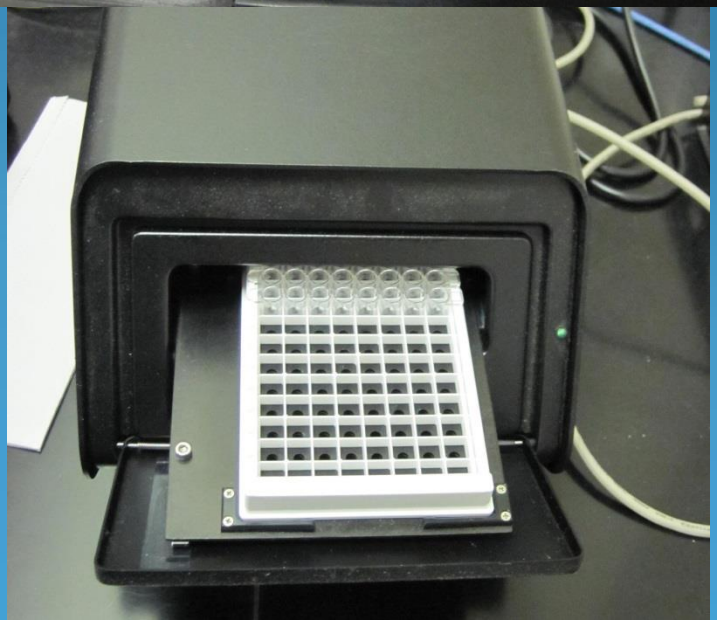
- 2013 - Microcystin Monitoring and Analysis initiated as part of Ambient Lake Monitoring Network.
- EPA Monitoring Initiative Grant
  - Purchased analysis equipment
  - Contracted lab to perform duplicate analysis for QA/QC

Monitoring Capacity Building

- ABRAXIS Plate Reader and Kits to perform:
  - Microcystins – ELISA (Enzyme-Linked Immunosorbent Assay). Method established through routine Lake Network monitoring.
  - Cylindrospermopsin - ELISA.
    **2015 New capacity for BFBM.
  - Anatoxin a – Receptor-Binding Assay (RBA).
    **2015 New capacity for BFBM.

Monitoring Capacity Building





Monitoring Capacity Building

- Microcystins (approx. 65 variants)
  - Method –ELISA
  - Detection level = 0.10 µg/l
- Cylindrospermopsin
  - Method - ELISA.
  - Detection level = 0.050 µg/l
- Anatoxin-a
  - Method – RBA
  - Detection level = 10 µg/l

Monitoring Capacity Building

- Combined with existing Chlorophyll a capacity
- Method - EPA Method 445.0
- Detection level = 0.05 µg/l

Routine Monitoring Results

Lake Monitoring Network
Probabilistic Lakes
Sampled in Growing Season

Relative Probability of Acute Health Effects (WHO recreational guidelines)	Microcystin-LR (µg/L)	Chlorophyll-a (µg/L)
Low	<10	<10
Moderate	10-20	10-50
High	20-2,000	50-5,000
Very High	>2,000	>5,000

	2013	2014	2015
# of lakes sampled	40	41	35 (so far)
Chl a range (µg/L)	1.1 - 65.2	0.7 - 128	0.6 - 120.6
Microcystins range (µg/L)	0.02 - 3.68	0 - 4.4	0 - 3.2

Lake Hopatcong, BFBM Sampling

- Alerted by Lake Commission
- Samples collected on 8/5/14

<u>BFBM Lab Analysis</u>

- Microcystin
- Chlorophyll ‘a’
- Cell identification

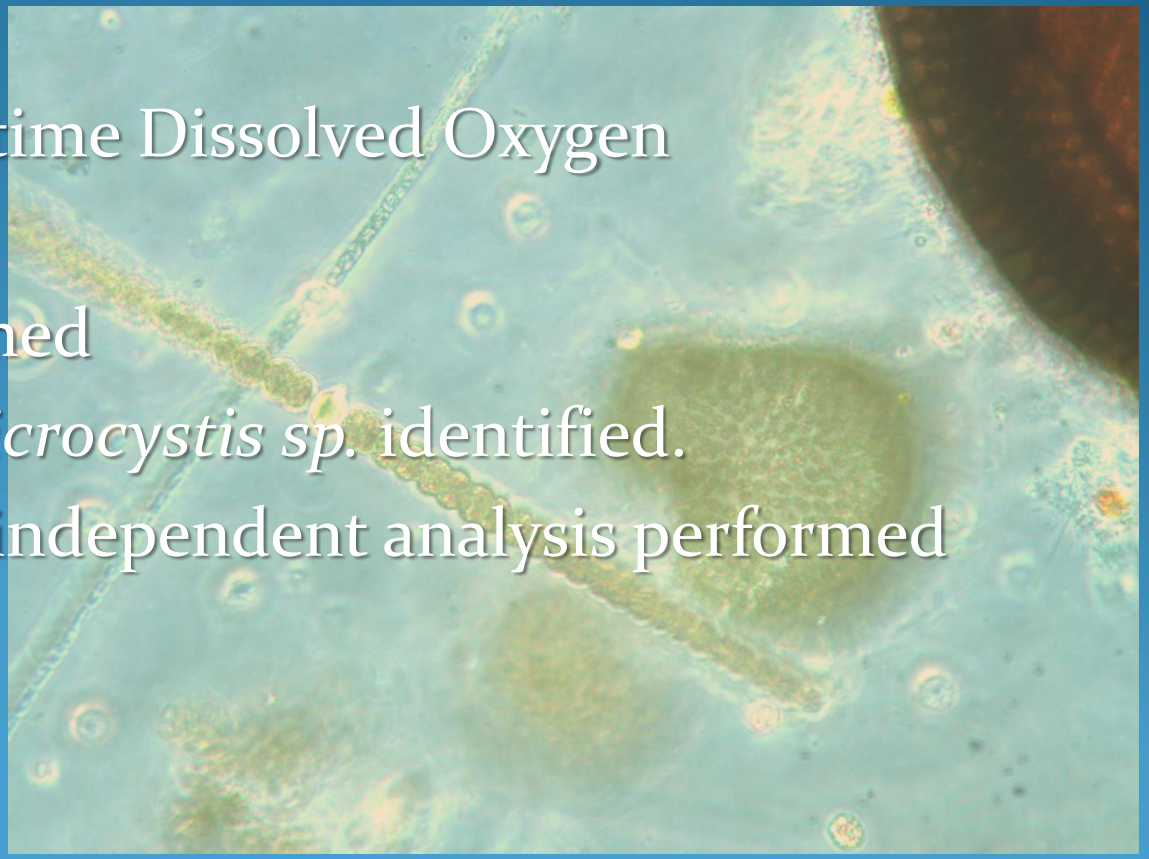
<u>Field Measurements</u>

- Dissolved Oxygen
- Conductivity
- Temperature
- pH
- Turbidity
- Secchi Depth

Lake Hopatcong, BFBM Sampling

Field Levels Observed Associated With Algal Blooms

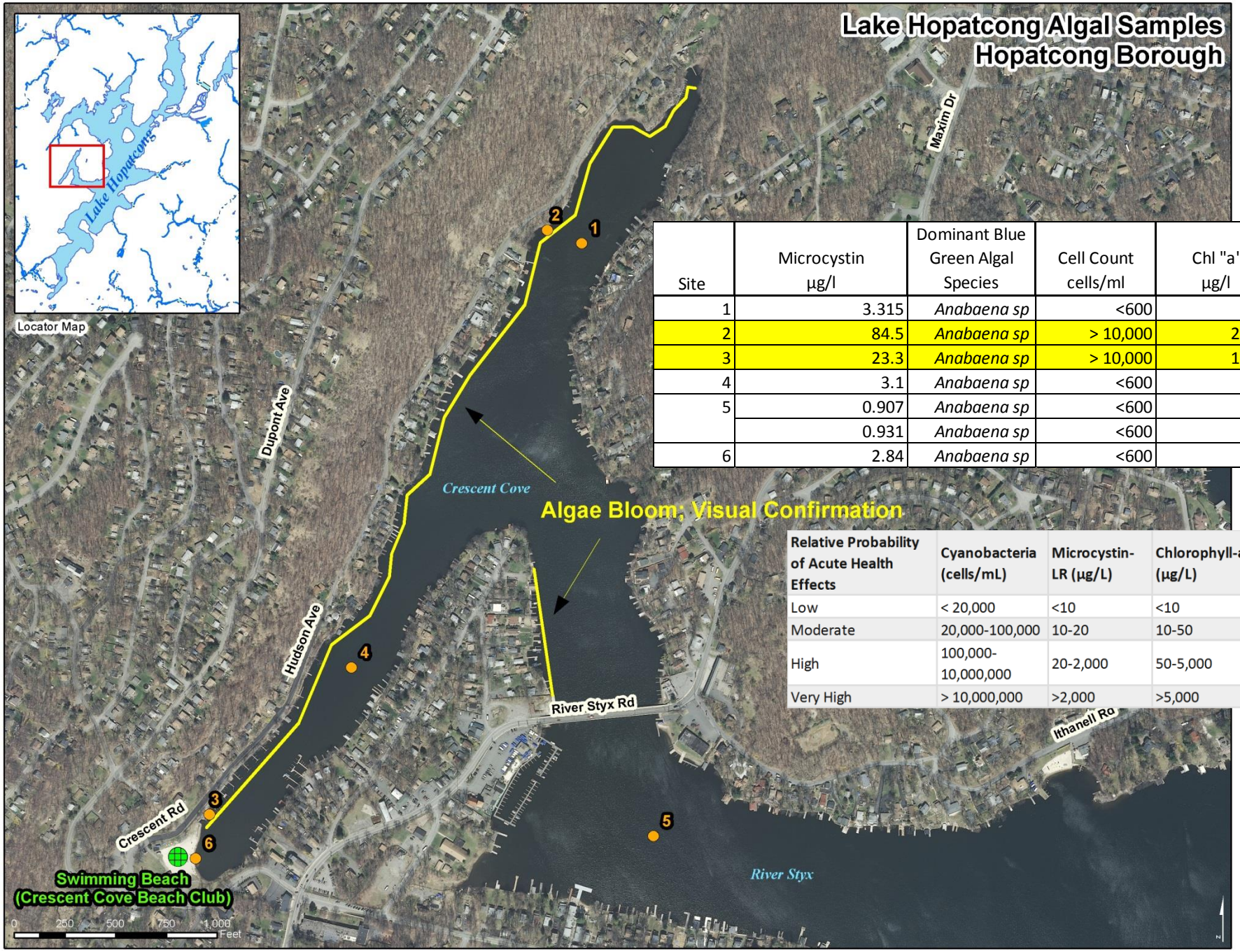
- Elevated Water Temperature
- Elevated pH
- Supersaturated Daytime Dissolved Oxygen



Cyanobacteria confirmed

- *Anabaena sp* and *Microcystis sp.* identified.
- IDs concurred with independent analysis performed by Princeton Hydro.

Lake Hopatcong Algal Samples
Hopatcong Borough



Site	Microcystin µg/l	Dominant Blue Green Algal Species	Cell Count cells/ml	Chl "a' µg/l
1	3.315	*Anabaena sp*	<600	61.9
2	84.5	*Anabaena sp*	> 10,000	275.9
3	23.3	*Anabaena sp*	> 10,000	181.5
4	3.1	*Anabaena sp*	<600	73.1
5	0.907	*Anabaena sp*	<600	27.2
	0.931	*Anabaena sp*	<600	28.9
6	2.84	*Anabaena sp*	<600	64.7

Relative Probability of Acute Health Effects	Cyanobacteria (cells/mL)	Microcystin-LR (µg/L)	Chlorophyll-a (µg/L)
Low	< 20,000	<10	<10
Moderate	20,000-100,000	10-20	10-50
High	100,000-10,000,000	20-2,000	50-5,000
Very High	> 10,000,000	>2,000	>5,000

CyanoHAB Workgroup

NJDEP and NJDOH Programs

NJDEP:

- Division of Water Supply
- Division of Water Monitoring & Standards
  - Bureau of Marine Water Monitoring
  - Bureau of Freshwater & Biological Monitoring
- Natural & Historic Resources
  - Office of Fish & Wildlife Health & Forensics
- Division of Science, Research and Environmental Health

CyanoHAB Workgroup

- Post Fact sheet – education and outreach
- Develop response plan
- Monitoring of lakes using volunteers
- Research project(s)
- Identify Resources

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER MONITORING AND STANDARDS

Cyanobacterial Harmful Algal Blooms (HABs)

August 2015

What are Cyanobacteria?

Cyanobacteria are a type of bacteria capable of photosynthesis. Although they are not true algae, they are often referred to as "blue-green algae". Cyanobacteria frequently impart off-tastes and odors to the water in which they grow, and sometimes they produce toxins that can be harmful to the health of humans and other animals. Although problems related to cyanobacteria most often occur in freshwaters (lakes and streams), cyanobacteria can also be found in marine waters.

What are Cyanobacterial Harmful Algal Blooms (HABs)?

A cyanobacterial Harmful Algal Bloom (HAB) is the name given to the excessive growth, or "bloom", of cyanobacteria, some of which can produce one or more types of potentially harmful toxins. HABs can occur under suitable environmental conditions of light, temperature, nutrients, and calm water. These "blooms" often result in a thick coating or "mat" on the surface of a waterbody, often in late-summer or early fall.

How do I identify a Cyanobacterial Harmful Algal Bloom (HAB)?

A cyanobacterial HAB often looks like a layer of bright bluish-green or white paint on the water surface. Other evidence of a potential cyanobacterial HAB could be discolored or pea-green colored water, parallel streaks, or green dots/globs in the water. It is important to note that some blooms are due to common green algae and not cyanobacteria and, when present, cyanobacteria do not always produce cyanotoxins. Below are some photographs of cyanobacterial HABs and also photographs of algal mats, surface films, plant pollen, or harmless plants that may resemble, but are not cyanobacterial HABs.

Cyanobacterial Harmful Algal Bloom (HAB) photos

HAB
(August 2014)

sampling a bloom for analysis

http://www.state.nj.us/dep/wms/bfbm/HABsFactSheet2015.pdf

QUESTIONS?

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